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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/609,311	06/26/2003	Donald L. Yates	MI22-2236	8026

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EXAMINER

BARRECA, NICOLE M

ART UNIT	PAPER NUMBER
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1756

DATE MAILED: 05/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/609,311	Applicant(s) YATES, DONALD L.	
	Examiner Nicole M. Barreca	Art Unit 1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-70 is/are pending in the application.
- 4a) Of the above claim(s) 58-70 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-57 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☒ Claim(s) 1-70 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>10/27/04; 8/30/04; 11/9/04; 12/23/04</u> | 6) <input type="checkbox"/> Other: ____ |

RL

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-57, drawn to a method for forming a semiconductor device, classified in class 430, subclass 311.
 - II. Claims 58-70, drawn to a semiconductor construction, classified in class 430, subclass 15.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the product as claimed can be made by another and materially different process, such as selective deposition or etching. The device claims are written in product-by-process form and are not limited to the manipulations of the recited steps, only the structure implied by the steps. See MPEP 2113.
3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art because of their recognized divergent subject matter, restriction for examination purposes as indicated is proper.
4. During a telephone conversation with Robert Hyta on 4/8/05 a provisional election was made with traverse to prosecute the invention of Group I, claims 1-57. Affirmation of this election must be made by applicant in replying to this Office action.

Claims 58-70 withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 1-4, 6-9, 11, 13-16, 20-26, 28, 30-32, 36-42, 44, 46, 48-51, 53, 55 and 56 are rejected under 35 U.S.C. 102(b) as being anticipated by Minter (US 6,255,035).

7. A first positive photoresist layer is formed onto a substrate, followed by a second positive photoresist layer, wherein the first and second photoresist layers are different types and have different solubilities (col.4, 9-col.6, 67). The photoresist layers are exposed to electron beam radiation and then exposed to UV radiation and developed with an aqueous alkaline developer such as TMAH (col.7, 23-43). The thickness of the first and second photoresist layers may be between 500-50,000 Angstroms (col.8, 8-16). Metal layers with a thickness of 3000-5000 Angstroms were deposited over the patterned photoresist layers, making the (first) photoresist layer less than 10% of the total thickness of the all overlying layers (col.10, 1-21). Figure 4 illustrates that the

sidewalls of the patterned first resist layer are laterally inward and different than the sidewall patterned second resist layer.

8. Claims 1, 2, 19-22, 35-37, 39, 40, 44, 53-56 are rejected under 35 U.S.C. 102(e) as being anticipated by Lu (US 6,817,086).

9. First photoresist layer (PR1) 302 and second photoresist layer (PR2) 304 are formed of positive photoresist. Light is exposed through a mask. The wafer is then subjected to a dissolver (developer) which removes the exposed parts of the second photoresist layer. The dissolver also partially removes the first photoresist layer forming partial undercuts 310 and 312. Figure 8 illustrates the prior art process, wherein the first photoresist pattern is curved, laterally inward, and different from the pattern formed in the second photoresist. See col.6, 1-24 and Figures 7 and 8.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. Claims 5 and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Minter as applied to claim 1 or 37 above, and further in view of Chumbres (US 3,772,101).

12. Minter uses positive photoresist and does not disclose using negative photoresist. Chumbres teaches that negative resist may be used instead of positive resist, if the transparent and opaque areas on the exposure mask are reversed (col.3,

41-52. It would have been obvious to one of ordinary skill in the art to use negative resist for the first and second resist layers instead of positive in the method of Minter because Chumbres teaches that that negative resist may be used instead of positive resist, if the transparent and opaque areas on the exposure mask are reversed.

13. Claims 10, 27 and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Minter as applied to claims 1, 22 or 37 above, and further in view of Shiihara (US 5,677,102).

14. Minter is silent on the specific solvents used in the resists. The reference however does teach that the photoresist compositions are dissolved in a compatible solvent. Shiihara teaches that organic solvents conventionally used in positive photoresist compositions include ethyl lactate and cyclohexanone (col4, 14-32). It would have been obvious to one of ordinary skill in the art to use ethyl lactate or cyclohexanone as the solvent in the photoresist in the method of Minter because Shiihara teaches that these solvents are conventionally used in positive photoresists in the art.

15. Claims 12, 17, 29, 33, 47 and 52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Minter as applied to claims 1, 22 or 37 above, and further in view of Nguyen (US 6,096,634).

16. Minter does not disclose that the first resist layer is thinner than second resist layer or that the first resist layer is less than or equal about 5% of the total thickness. Nguyen teaches that thinner resist layers give smaller features, thereby establishing the resist layer thickness as a result-effective variable. It would within the ordinary skill of

one in the art to determine the optimal resist layers thickness in the method Minter by routine experimentation and to have the first resist layer is thinner than second resist layer or to have the first resist layer is less than or equal about 5% of the total thickness, if required, because the thickness of the resist layer is a result-effective variables, as taught by Nguyen, respectively and the discovery of an optimum value of a result effective variable is ordinary within the skill of the art, as taught by *In re Boesch*, (617 F.2d 272, 205 USPQ 215 (CCPA 1980)).

17. Claims 18, 34 and 57 are rejected under 35 U.S.C. 103(a) as being unpatentable over Minter as applied to claims 1, 22, or 37 above, and further in view of Grober (US 6,376,149).

18. Minter uses the pattern of the resist layers for material deposition and does not disclose using the pattern as an etching mask. Grober teaches that typically photoresist patterns are used for material deposition, implant doping or plasma etching (col.1, 27-35). It would have been obvious to one of ordinary skill in the art to use the resist pattern in the method of Minter as an etching mask, instead of for material deposition, because Grober teaches that both are typical uses for photoresist patterns in the art.

Conclusion

19. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Herbst (US 6,582,888) and Breyta (US 2001/0005747) disclose methods wherein bi-layer resist produce an undercut pattern.

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20. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nicole M. Barreca whose telephone number is 571-272-1379. The examiner can normally be reached on Monday-Thursday (9AM-7PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Nicole M Barreca
Examiner
Art Unit 1756

4/27/05

